

CMOS / SONOS Nonvolatile Memory Technology for Space and Avionics Applications*

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Abstract – Silicon-Oxide-Nitride-Oxide-Semiconductor (SONOS) based nonvolatile semiconductor memories (NVSMs) have been in production for over 30 years for a wide range of commercial and military applications. Through a joint collaboration between Northrop Grumman Corporation, Sandia National Laboratories, Lehigh University and ATK Mission Research, a family of SONOS-based NVSMs have been developed for high reliability requirements for space and avionics systems. 64K / 256K / 1M EEPROM devices are currently being manufactured at the Northrop Grumman fabrication facility in Baltimore, MD. ATK Mission Research has performed radiation testing for these products. Design work was performed by Sandia National Laboratories. SONOS modeling, test and characterization work has been done at Lehigh University.

SONOS technology relies on charge storage in a nitride dielectric. This technology has been proven to be highly reliable in the harsh environments encountered in space and avionics. Key specifications for this family of products are:

- 10 to 100 year memory retention
- 10,000 endurance cycles
- 300 krads(Si) total dose
- No latch-up
- -55 C to +125 C operation
- No memory loss from prompt dose irradiation
- >5E8 Rads(Si)/sec for READ upset

The NGC 64K and 256K EEPROM devices have been in production for over 5 years and remain the only NVSM choice for space applications requiring total dose hardness above 50 krads(Si). These devices have been successfully deployed in over 25 space applications. Two 1M EEPROM designs (128Kx8, 64Kx8) have been prototyped and are scheduled to complete Qualification during 2006. Development has been started on a 16M EEPROM device that will employ 0.35 um CMOS SONOS with 4 level metal interconnect. First test vehicle wafers will complete at the end of 2005. This paper will present the latest data on this family of SONOS based EEPROM devices.